WHAT IS CLAIMED IS:

1. A method for underfilling a semiconductor component on a substrate having a plurality of substrate contacts comprising:

providing a plurality of terminal contacts on the component comprising a solder alloy;

providing an underfill material comprising a polymer base material and a plurality of electrically conductive particles in the base material comprising a metal configured to melt and alloy with the solder alloy;

depositing the underfill material on a selected area of the substrate or the component; and

bonding the terminal contacts to the substrate contacts to form a plurality of electrical connections at least some of which include solder layers comprised of the particles.

2. The method of claim 1 wherein the particles comprise the solder alloy or a second solder alloy.

3. The method of claim 1 wherein the particles comprise a metal selected from the group consisting of Sn, Pb, Ag, Au, Ge, Cu and In.

4. The method of claim 1 further comprising curing the underfill material following the forming step.

5. The method of claim 1 wherein the forming step is performed by reflowing the terminal contacts.

6. A method for underfilling a semiconductor component on a substrate having a plurality of substrate contacts comprising:

providing a plurality of terminal contacts on the component comprising a solder alloy;

providing an underfill material comprising a polymer base material and a plurality of electrically conductive particles in the base material;

depositing the underfill material on the substrate or on the component;

placing the terminal contacts in contact with the substrate contacts while the underfill material is in a viscous state; and

forming a plurality of connections on the substrate contacts and a plurality of solder layers between the connections and the substrate contacts by melting and alloying the particles with the terminal contacts.

7. The method of claim 6 further comprising curing the underfill material following the forming step.

8. The method of claim 6 wherein the particles have a diameter of from 1 μm to 10 μm.

9. The method of claim 6 wherein the particles have a diameter of less than about 5 μm.

10. The method of claim 6 wherein the particles have a volume percentage of a total volume of the underfill material of from about 10% to 50%.

11. The method of claim 6 wherein the forming step is performed at a first temperature range and the particles melt at the first temperature range.

12. The method of claim 6 wherein the particles comprise a eutectic solder alloy.

13. The method of claim 6 wherein the particles comprise a metal selected from the group consisting of Sn, Pb, Ag, Au, Ge, Cu and In.

14. The method of claim 6 wherein the underfill material has a viscosity during the depositing step of from 7,000 to 200,000 cps.

15. The method of claim 6 wherein the component comprises a semiconductor package, a semiconductor wafer or a semiconductor die.

16. A method for attaching a semiconductor component to a substrate having a plurality of substrate contacts comprising:

providing a plurality of terminal contacts on the component comprising a solder alloy;

providing an underfill material comprising a polymer base material having a no flow viscosity at a first temperature of from 22°C to 100°C., and a plurality of electrically conductive particles in the polymer base material configured to melt at a second temperature of from 150 °C to 250 °C;

depositing the underfill material on the substrate or on the component;

placing the terminal contacts and the substrate contacts in physical contact at the first temperature; and

heating the terminal contacts and the substrate contacts to the second temperature to bond the terminal contacts and at least some of the particles to the substrate contacts.

17. The method of claim 16 further comprising curing the underfill material at a third temperature.

18. The method of claim 16 wherein the component comprises a semiconductor package, a semiconductor wafer or a semiconductor die.

19. The method of claim 16 wherein the polymer base material comprises a material selected from the class consisting of epoxy, silicone and polyimide.

20. The method of claim 16 wherein the particles comprise the solder alloy.

21. The method of claim 16 wherein the particles comprise a metal selected from the group consisting of Sn, Pb, Ag, Au, Ge, Cu and In.

22. The method of claim 16 wherein the particles have a diameter of from 1 μm to 10 μm.

23. The method of claim 16 wherein the particles have a volume percentage of a total volume of the underfill material of from about 10% to 50%.

24. The method of claim 16 wherein the particles have a volume percentage of a total volume of the underfill material of less than about 50%.

25. The method of claim 16 wherein the particles have a volume percentage of a total volume of the underfill material of less than about 30%.

26. The method of claim 16 wherein the no flow viscosity is from 7,000 to 200,000 cps.

27. A method for attaching a semiconductor component to a substrate having a plurality of substrate contacts comprising:

providing a plurality of solder terminal contacts on the component;

providing a no flow underfill material comprising a polymer base material and a plurality of solder particles;

depositing the underfill material on the substrate or on the component in a viscous state;

placing the terminal contacts in contact with the substrate contacts while the underfill material is in the viscous state;

bonding the terminal contacts to the substrate contacts to form connections therebetween; and

melting the solder particles during the bonding step to bond at least some of the solder particles to at least some of the substrate contacts.

28. The method of claim 27 further comprising curing the underfill material.

29. The method of claim 27 wherein the underfill material has a viscosity in the viscous state of from 7,000 to 200,000 cps.

30. The method of claim 27 wherein the depositing step is performed at a first temperature range of from 22°C to 100°C.

31. The method of claim 27 wherein the bonding step is performed at a second temperature range of from 150°C to 250°C.

32. The method of claim 27 wherein the particles have a diameter of from 1 μm to 10 μm.

33. A method for underfilling a semiconductor component having a plurality of terminal contacts on a substrate having a plurality of substrate contacts comprising:

providing the component on a wafer sized component;

providing an underfill material comprising a polymer base material and a plurality of electrically conductive particles in the base material;

depositing the underfill material on the wafer sized component;

separating the component from the wafer sized component with the underfill material thereon;

placing the terminal contacts on the component in contact with the substrate contacts while the underfill material is in a viscous condition; and

forming a plurality of connections on the substrate contacts and a plurality of solder layers between the connections and the substrate contacts by melting and alloying the particles with the terminal contacts.

34. The method of claim 33 further comprising curing the underfill material following the forming step.

35. The method of claim wherein the viscous state comprises a semi cured condition.

36. An underfill material for encapsulating connections between a semiconductor component and a substrate comprising:

an electrically insulating polymer base material configured for deposition onto the substrate or the component as a non-flowing viscous material; and

a plurality of solder particles in the base material configured to melt and to rigidify the connections.

37. The underfill material of claim 36 wherein the particles comprise a eutectic solder.

38. The underfill material of claim 36 wherein the particles have a diameter of from 1 μm to 10 μm.

39. The underfill material of claim 36 wherein the particles have a volume percentage of a total volume of the underfill material of from about 10% to 50%.

40. The underfill material of claim 36 wherein the particles have a volume percentage of a total volume of the underfill material of less than about 50%.

41. The underfill material of claim 36 wherein the particles have a volume percentage of a total volume of the underfill material of less than about 30%.

42. An underfill material for encapsulating connections between a semiconductor component and a substrate comprising:

a polymer base material having a viscosity of from 7,000 to 200,000 cps at a temperature of from 22°C to 100°C; and

a plurality of solder particles in the base material having a volume percentage of a total volume of the underfill material of from 10% to 50% and a melting temperature of from 150°C to 250°C.

43. The underfill material of claim 42 wherein the polymer base material comprises a material selected from the group consisting of epoxy, silicone and polyimide.

44. The underfill material of claim 42 wherein the particles comprise a eutectic PbSn solder.

45. The underfill material of claim 42 wherein the particles comprise a SnAgCu solder alloy.

46. The underfill material of claim 42 wherein the particles have a diameter of from 1 μm to 10 μm.

47. An underfill material for encapsulating connections between a semiconductor component and a substrate comprising:

a polymer base material having a no flow viscosity at a temperature of from 15.5°C to 37.8°C;

a plurality of solder particles in the base material having a diameter of from 1 μm to 10μm, a melting temperature

of from 150°C to 250°C. and a concentration selected such that the underfill material is non-conductive in X and Y directions; and

a curing agent in the base material configured to cure the base material.

48. The underfill material of claim 47 wherein the curing agent comprises a solvent or a reactant.

49. The underfill material of claim 47 wherein the concentration expressed as a volume percentage of a total volume of the underfill material is from about 10% to 50%.

50. The underfill material of claim 47 wherein the concentration expressed as a volume percentage of a total volume of the underfill material is less than about 50%.

51. The underfill material of claim 47 wherein the concentration expressed as a volume percentage of a total volume of the underfill material is less than about 30%.

52. The underfill material of claim 47 wherein the particles comprise eutectic solder.

53. An underfill material for encapsulating connections between a semiconductor component and a substrate comprising:

an electrically insulating polymer base material configured for deposition onto the substrate or the component as a non-flowing viscous material; and

a plurality of metal particles in the base material configured to melt and to rigidify the connections, the metal particles comprising a metal selected from the group consisting of Sn, Pb, Ag, Au, Ge, Cu and In.

54. The underfill material of claim 53 wherein the particles have a diameter of from 1 μm to 10 μm.

55. The underfill material of claim 53 wherein the particles have a volume percentage of a total volume of the underfill material of from about 10% to 50%.

56. The underfill material of claim 53 wherein the particles have a volume percentage of a total volume of the underfill material of less than about 50%.

57. The underfill material of claim 53 wherein the particles have a volume percentage of a total volume of the underfill material of less than about 30%.

58. An electronic system comprising:

a semiconductor component comprising a plurality of solder terminal contacts;

a substrate comprising a plurality of substrate contacts;

a plurality of connections between the terminal contacts and the substrate contacts; and

an underfill layer attaching the component to the substrate and encapsulating the connections, the underfill layer comprising a polymer base material and a plurality of conductive particles in the base material at least some of which are bonded to the connections and the substrate contacts.

59. The system of claim 58 wherein the substrate comprises a module substrate and the system comprises a multi chip module.

60. The system of claim 58 wherein the particles comprise solder.

61. The system of claim 58 wherein the particles have a diameter of from 1 μm to 10 μm.

62. The system of claim 58 wherein the particles have a volume percentage of a total volume of the underfill layer of from about 10% to 50%.

63. The system of claim 58 wherein the particles have a volume percentage of a total volume of the underfill layer of less than about 50%.

64. The system of claim 58 wherein the particles have a volume percentage of a total volume of the underfill layer of less than about 30%.

65. An electronic system comprising:

a semiconductor component comprising a plurality of terminal contacts comprising a solder alloy;

a substrate comprising a plurality of substrate contacts;

a plurality of connections between the terminal contacts and the substrate contacts; and

an underfill layer attaching the component to the substrate and encapsulating the connections, the underfill layer comprising a polymer base material having a viscosity of from 7,000 to 200,000 cps at a temperature of from 22°C to 100°C., and a plurality of conductive particles in the base material configured to alloy with the solder alloy, and having a volume percentage of a total volume of the underfill layer of from 10% to 50% and a melting temperature of from 150°C to 250°C.

66. The system of claim 65 wherein the polymer base material comprises a material selected from the group consisting of epoxy, silicone and polyimide.

67. The system of claim 65 wherein the particles comprise the solder alloy.

68. The system of claim 65 wherein the particles comprise a second solder alloy.

69. The system of claim 65 wherein the particles comprise a metal selected from the group consisting of Sn, Pb, Ag, Au, Ge, Cu and In.

70. The system of claim 65 wherein the particles have a diameter of from 1 μm to 10 μm.

71. An electronic system comprising:

a semiconductor component;

a substrate;

an underfill layer attaching the component to the substrate comprising a polymer base material, and a plurality of solder particles in the base material; and

a plurality of connections between the component and the substrate encapsulated in the underfill layer, at least one of the connections comprising a solder layer comprising a plurality of the solder particles.

72. The system of claim 71 wherein the connections comprise solder terminal contacts on the components.

73. The system of claim 71 wherein the connections, the solder layer and the solder particles comprise eutectic solder.

74. The system of claim 71 wherein the underfill layer has a viscosity of from 7,000 to 200,000 cps at a temperature of from 22°C to 100°C.

75. The system of claim 71 wherein the solder particles have a volume percentage of a total volume of the underfill layer of from 10% to 50%.

76. The system of claim 71 wherein the solder particles have a melting temperature of from 150°C to 250°C.

77. The system of claim 71 wherein the component comprises a semiconductor package, a semiconductor wafer or a semiconductor die.

78. The system of claim 71 wherein the substrate comprises a module substrate and the system comprises a multi chip module.